Starter Questions

Write down the value of $125^{\frac{1}{3}}$.

Find the value of $125^{-\frac{2}{3}}$.

Write down the value of $16^{\frac{1}{4}}$.

Simplify $(16x^{12})^{\frac{3}{4}}$.

B Algebra and functions

B1 Understand and use the laws of indices for all rational exponents.

Assessed at AS and A-level

Teaching guidance

Students should be able to:

- understand and use the following laws:

$$x^a \times x^b = x^{a+b} \qquad x^a \div x^b = x^{a-b} \qquad \left(x^a\right)^b = x^{ab}$$

$$x^{-a} = \frac{1}{x^a} \qquad x^{\frac{a}{b}} = \sqrt[b]{x^a} = \left(\sqrt[b]{x}\right)^a$$

- apply these laws when solving problems in other contexts, for example simplification of expressions before integrating/differentiating, solving equations or transforming graphs.

1.2 Index Laws

In the expression below, label the **base**, the **index** and the **coefficient**

$$3x^5$$

Make a list of the index laws that you can recall.

- $x^0 = 1$
- $x^{-n} = \frac{1}{x^n}$
- $x^n \cdot x^m = x^{n+m}$
- $x^n \div x^m = x^{n-m}$
- $(x^n)^m = x^{n \cdot m}$
- $x^{\frac{n}{m}} = \sqrt[m]{x^n}$

1.2 Index Laws

Example 1

$(g^2h^3)\times(-g^7h^5)\div(ghi^4)$

¿ $-\dfrac{g^8h^7}{i^4}$

$\sqrt[3]{-125t^{27}c^{12}}$

¿ $-5t^9c^4$

If $6^{2t+1}=216$, find the value of t

Hint:

$t=1$

1.2 Index Laws

Example 2

Solve the equation

$$25^{x} = 5^{4x+1}.$$

Hint: $x = -\frac{1}{2}$

$$4^{x} - 2^{x+2} - 32 = 0$$

Hint: Hint: $x = 3$

1.2 Index Laws

Example 3

$$f(x) = \frac{(3 - 4\sqrt{x})^2}{\sqrt{x}}, \quad x > 0$$

Show that $f(x) = 9x^{-\frac{1}{2}} + Ax^{\frac{1}{2}} + B$, where A and B are constants to be found.

Mixed Exercise 1

Do questions 1, 8, 9, 15, 19, 22, 23, 24

B Algebra and functions

B2 Use and manipulate surds, including rationalising the denominator.

Assessed at AS and A-level

Teaching guidance

Students should be able to:

- demonstrate they understand how to manipulate surds and rationalise denominators
- answer algebraic questions.

Notes

- Questions requiring simplification of surds should usually be done with a calculator, but students are expected to know the process of rationalising a surd denominator and to be able to show this step.

1.3 Surds

A **rational number** is one that you can write exactly in the form $\frac{p}{q}$ where p and q are integers, q ≠ 0

Irrational numbers cannot be written in this form. As decimals, they have an infinite number of non-repeating decimal places.

Irrational numbers involving roots are

1.3 Surds

Irrational numbers involving roots are called **surds**.

Surds can be simplified using the formula $\sqrt{(a \times b)} = \sqrt{a} \times \sqrt{b}$

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

1.3 Surds

Example 1

a) Simplify $\sqrt{12}$

b) Simplify $\sqrt{\frac{3}{16}}$

c) Find $(2\sqrt{5}+3\sqrt{6})^2$

d) Express $\sqrt{63}-\sqrt{28}$ in the form $k\sqrt{x}$ where k and x are integers.

1.3 Surds

Example 2

a) Show that $\frac{9}{\sqrt{3}} = 3\sqrt{3}$.

b) Rationalise the denominator of $\frac{1}{1+\sqrt{2}}$.

c) Rationalise the denominator of $\frac{7+\sqrt{5}}{3+\sqrt{5}}$.

1.3 Surds

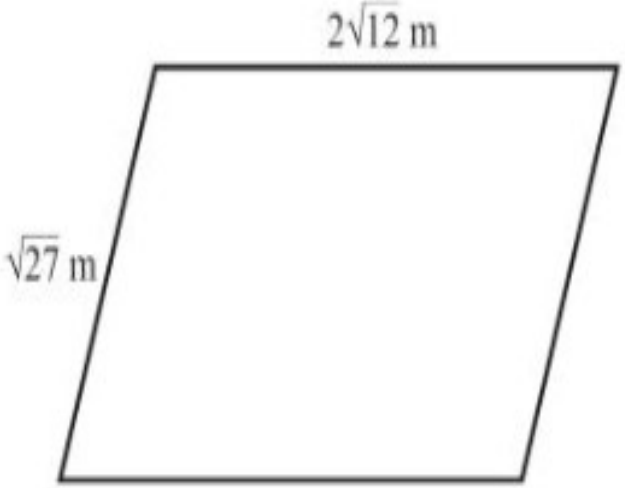
Example 3

The sides of a parallelogram are $\sqrt{27}$ m and $2\sqrt{12}$ m, and it has a perpendicular height of $\frac{10}{\sqrt{3}}$ m.

a Work out the perimeter of the parallelogram.

b Work out the area of the parallelogram.

Give your answers in their simplest form.



xed Exercise 1
questions 10, 12, 13, 16, 17, 20, 21 & challe